

Product Description Document (PDD)
Enhancement to Experimental Short Range River Forecast Uncertainty
December 2021

Part 1 - Mission Connection

a. Product Description - A graphical depiction of short- to medium-range river forecast uncertainty. The product displays uncertainty bounds for the river forecast in the context of high and low water thresholds used in the NWS Water Resources Web presence.

b. Purpose - Providing uncertainty bounds for hydrologic forecasts at all time scales is a pressing need of operational hydrologic forecasting [NRC report (2006), CFI survey (2008), multiple NWS service assessments].

NOAA's National Weather Service (NWS) has implemented a short- to long-range Hydrologic Ensemble Forecast Service (HEFS) to address this need. The HEFS extends the existing hydrologic ensemble services to include short- to medium-range forecasts, incorporates additional weather and climate information, and better quantifies uncertainty in hydrologic forecasting. It provides, at forecast time horizons of less than a day to more than a year, ensemble forecasts and verification products that can be tailored to users' needs.

In 2019, the Nurture Nature Center conducted a social science study, which involved multiple scenario-based focus groups and surveys across the United States with professionals and residents, to examine their use and understanding of probabilistic and deterministic hydrologic forecast information. This study has resulted in the proposed enhancements to the use of color, specific language and word choice in legends, and placement of information for the HEFS Short Range River Forecast Uncertainty Product graphic.

c. Audience - General public, emergency managers, water managers and stakeholders, electronic media, NOAA, NWS, U.S. Army Corps of Engineers (USACE), Federal Emergency Management Agency (FEMA) and other federal, state, and local government agencies.

d. Presentation Format - From a river location hydrograph (for example <https://water.weather.gov/ahps2/hydrograph.php?wfo=ctp&gage=htvp1>), the user will select the "Probability Information" tab and select "Short-term Probabilistic Guidance" to display the HEFS Short Range River Forecast Uncertainty Product.

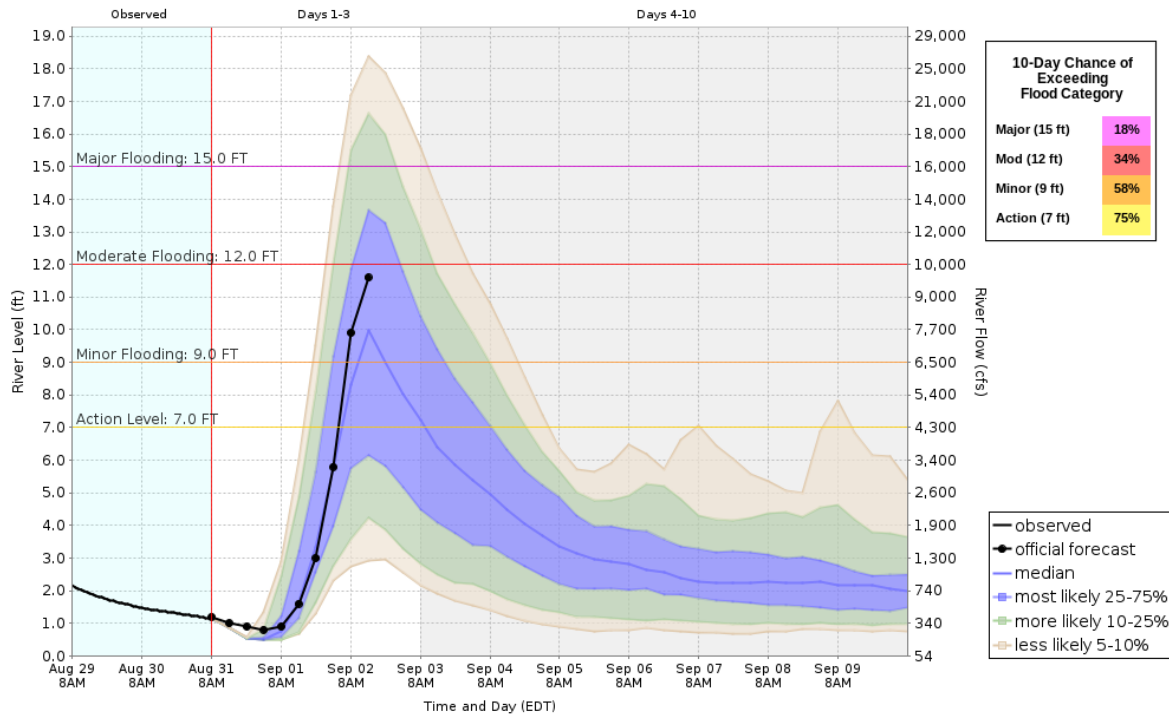
HEFS - 10 Day River Level Probabilities

Based on Hydrologic Ensemble Forecast Service Model Simulations
Used to Estimate the Range of Possible River Levels



Aug 31 - Sep 10, 2021

Swatara Creek at Harper Tavern, PA



Model runtime: 08:00 AM EDT Aug 31 2021
Middle Atlantic River Forecast Center

e. Feedback Method – proposed URL:

<https://www.surveymonkey.com/r/ExpShortRangeRiverForecastUncertainty>

Technical and policy questions regarding this experimental forecast product may be addressed to:

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Part II – Technical Description

a. **Format and Science Basis** - The HEFS is an operational ensemble prediction service that leverages skill in weather and climate forecasts to produce reliable and skillful ensemble forecasts of streamflow at forecast lead times ranging from 1 hour to 1 year. HEFS provides uncertainty ranges for hydrologic forecasts at all time scales and enables better risk-informed decisions to support water management and emergency management. Internal assessments, outside research entities, and national/local level stakeholders such as the United States Army Corps of Engineers (USACE) and the Federal Emergency Management

Agency (FEMA), have expressed a strong desire for this information. A human engineering study, completed in 2008, provided recommendations regarding the most effective means to communicate this information.

Recommendations as described in the Bulletin of the American Meteorological Society report published in October 2021, entitled “[Improving the Use of Hydrologic Probabilistic and Deterministic Information in Decision-Making](#)”, along with input from previous experimental ensemble products, were used to update the graphical representation of hydrologic forecast uncertainty as shown. The concepts for this graphic were tested and surveyed by the team working with the Nurture Nature Center of Easton PA in order to meet the needs of both residential and professional users related to probabilistic and deterministic forecasts.

Users provided discrete and helpful suggestions about the use of color, specific language and word choice in legends, and placement of information to remove barriers to understanding. For example, the darkest blue region highlights the river levels that have the greatest chance of occurring at that location in time. The recommendations has led to the enhancement of the two legends:

1. 10-day chance of exceeding flood category in the top right
2. Redesign of the legend that contain numeric quantifications of probabilities, as well as observed, median, and forecast river levels in the lower right

Note: Displaying the official forecast line and median is optional.

b. Availability - The experimental product will be accessible from the NWS “Probability Information” tab, e.g.,

<https://water.weather.gov/ahps2/hydrograph.php?wfo=ctp&gage=htvp1>

or directly via a link similar to:

https://water.weather.gov/ahps2/probability_information.php?wfo=ctp&gage=htvp1&graph_id=3

c. Additional Information - See [Water Resources Information on the Web A Manual for Users](#) page 18.